A FLORISTIC SURVEY OF THE DERRIMUT GRASSLAND RESERVE, MELBOURNE, VICTORIA

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The 154 ha Derrimut Grassland Reserve contains the largest *Themeda* grassland on public land on the basalt plains of western Victoria. It includes three types of wetland and two of grassland. Wetland vegetations appear to be dependent upon the duration of seasonal flooding, and grassland vegetations on previous land use, particularly ploughing. A total of 102 species of native plants and 78 exotics are listed; three native species are rare or vulnerable in Victoria.

ONE of the most important issues for nature conservation in temperate Australia is the preservation of native grasslands and grassy woodlands. Grasslands of *Themeda, Stipa, Danthonia* and *Poa* once dominated extensive areas of temperate New South Wales, Victoria, Tasmania and south-eastern South Australia but were rapidly destroyed by agriculture. Today only small patches remain, few of them protected in conservation reserves (Groves 1979, Specht 1981a, Davies 1982, Frood & Calder 1987, Kirkpatrick et al. 1988).

The original *Themeda* grasslands were dominated by *T. triandra* with sub-dominant *Danthonia* and *Stipa* species. The grasses formed discrete tussocks rather than a closed turf, and a variety of herbs, particularly composites, grew on the bare earth in the inter-tussock spaces (Patton 1935, Willis 1964).

Many of the most diverse remnants of *Themeda* grassland in Victoria are on railway reserves that have been burnt regularly and grazed infrequently over the past 100 years (Stuwe & Parsons 1977, Stuwe 1986). If grasslands are to be effectively protected, then the narrow and typically small remnants of railway reserves must be supplemented by larger remnants; invariably these have been grazed and are of lower diversity than rail-line remnants (Stuwe & Parsons 1977).

The Keilor basalt plains, immediately west of Melbourne, encompass many of the best, large remnants of *Themeda* grassland in western Victoria (Stuwe 1986) plus two of the largest reserves for *Themeda* grassland in the State: the Laverton North and Derrimut Grassland Reserves, of 40 ha and 154 ha respectively. This paper presents the results of a floristic survey of the Derrimut Grassland Reserve.

SITE DESCRIPTION

The Derrimut Grassland Reserve occupies 154 ha on the north-eastern corner of Boundary and Fitzgerald Roads in the City of Sunshine, 14 km west of Melbourne. The mean annual rainfall at Laverton, 7 km SSW of the reserve, is 568 mm (Bureau of Meteorology, unpublished data) and is evenly distributed throughout the year. The maximum monthly mean temperature is 26°C in January and the mean minimum is 5°C in July. The reserve is situated on the Keilor basalt plains, the underlying rock being olivine basalt belonging to the Newer Volcanics, of Early Pleistocene age (Mines Department, undated; Douglas 1982). Surface rock is locally abundant in the reserve and the topography is gently undulating (Fig. 1). Most soils are duplex but gradational soils occur in some areas of low elevation and poor drainage. Topsoils are of silty clay, silty clay loam and clay loam, and generally are neutral to slightly basic, with pH ranging from 6.0 to 7.5. Hummocks about 1 m in diameter and depressions ("gilgai" topography) in the north-east of the reserve reflect small-scale variations in the soil profile (Lunt 1987). A semi-permanent lake called Lake Stanley or Andersons Marsh occupies an area of about 15 ha in the southern part of the reserve (Fig. 1). A major drainage line flows intermittently into Lake Stanley from the north-west, and a minor drainage line flows from the north-east.

Fig. 1. Distribution of vegetation types in 61 quadrats in Derrimut Grassland Reserve. Open, semi-closed and closed circles and squares denote species-poor, moderate and species-rich *Vulpia* grassland and *Themeda* grassland respectively; open stars denote *Eleocharis* sedgeland; closed stars denote *Amphibromus-Agrostis* grassland; triangles denote mixed-species herbland. Shaded areas were ploughed last century. Contour interval is 1 m (Melbourne & Metropolitan Board of Works 1978). Horizontal dotted line denotes an old fenceline.

SITE HISTORY

The property was owned by the Myers family from 1912 until the 1950s when it was bought by the Victorian Government, but it was grazed by the family's stock until 1985 (D. Myers, personal communication; source also of the following agricultural information). Three to four hundred head of sheep (3 to 4 per hectare) were run until the late 1960s when they were replaced by 80 to 90 head of cattle. On two occasions in the early 1960s the site was heavily grazed for a fortnight by 6,000 to 7,000 sheep. Although all of the vegetation was consumed, *Themeda triandra* and other grasses recovered after the first rains. The property was divided in two by an east-west fence (Fig. 1). Grazing pressure was greater in the southern paddock and where cattle congregated at the western end of the fence. Three areas of the reserve were ploughed, and presumably cropped, in the late 1800s (Fig. 1) but there has been no ploughing or cropping since 1912 and probably none since 1900. The site was rarely burnt and superphosphate was never applied.

METHODS

Sampling

Minimal quadrat area (defined as the point at which a 10% increase in area yields only a 5% increase in species; Mueller-Dombois & Ellenberg 1974) was determined from two sites dominated by *T. triandra*, and was found to be between 9 m^2 and 11 m^2. A quadrat size of 15 m^2 (5 × 3 m) was employed.

Quadrats were sampled in November and December of 1986 and 1987. Fifty-one were located at 100 m intervals on six transects set 200 m apart and ten were selectively placed in vegetations that were inadequately sampled on transects (Fig. 1). Quadrats were orientated to include uniform vegetation. In each quadrat, the cover of all species of vascular plants was recorded using the Braun-Blanquet scale (Mueller-Dombois & Ellenberg 1974), with the Braun-Blanquet category "r" being included in the category "+". The reserve was exhaustively traversed between November 1986 and January 1988 and a comprehensive list made of all species not found in quadrats. Plant taxonomy follows Forbes & Ross (1988), and exotic species are marked with an asterisk. Specimens of many species are lodged with the National Herbarium of Victoria (MEL).

Classification

The program MAGIC — a polythetic, agglomerative, non-hierarchical cluster analysis utilizing presence/absence data (Gullan 1978) — was used to classify quadrats according to floristic composition. Quadrat and species groups from the classification were hand-sorted for clearer resolution of the floristic table. Data are permanently stored on the database of the Flora and Fauna Survey Group of the Department of Conservation, Forests and Lands of Victoria, as quadrats B18181 to B18234 (quadrats 1 to 54) and E01401 to E01407 (quadrats 55 to 61).

The Tukey-Kramer test, suitable for unplanned, multiple comparisons among pairs of means based on unequal sample sizes (Sokal & Rohlf 1981), was used to test differences in species-richness between vegetation groups.

RESULTS AND DISCUSSION

Plant species

One hundred and eighty species of vascular plants were recorded from the reserve (see Appendix), including 102 natives (57% of species) and 78 exotics (43%). All but six species were herbs and many of the most widespread species in the reserve were exotic (Table 1). Three of the native species recorded are rare or vulnerable in Victoria: *Comesperma polygaloides*, *Stipa gibbosa* and *Stipa setacea* (Gullan et al., in prep.). The reserve included 26% of the 391 species of native plants that occur on the Keilor basalt plains (Willis 1964). Although Asteraceae, Poaceae and Cyperaceae were the largest families in the reserve and on the plains in general, many large families on the plains were absent from or poorly represented at Derrimut; for example, the reserve included only one of 15 orchid species, two of 13 native legumes and none of the 14 native chenopods recorded from the Keilor basalt plains.

Vegetation types

Two major vegetation groups, wetland vegetation and grassland vegetation, were identified from the floristic table (Table 2). They were divided into five minor groups, comprising three wetland vegetations (*Amphibromus-Agrostis* grassland, *Eleocharis* sedgeland and mixed-species herbland) and two grassland vegetations (*Themeda* grassland and *Vulpia* grassland).

The five minor groups were differentiated by floristic and structural features, and their names refer to the dominant species and vegetation structure (after Specht 1981b): mixed-species herbland was co-dominated by a number of species. In the following discussion, "grasslands" refer to *Themeda* and *Vulpia* grasslands and do not include the minor wetland group, *Amphibromus-Agrostis* grassland, unless otherwise noted. The term "species richness" denotes the mean number of species in each quadrat.

Wetland vegetation

"Wetland vegetation" is a convenient name to encompass three minor groups of diverse structure and composition but similar habitat. They occurred in areas that were seasonally or almost permanently inundated: the margins of Lake Stanley and small depressions along drainage lines and within grasslands. The eastern drainage line did not carry surface water for sufficiently long periods to support wetland vegetation.

Amphibromus-Agrostis grassland was co-dominated by *Amphibromus nervosus* and *Agrostis avenacea* (Fig. 2). It was restricted to a narrow band on the edge of Lake Stanley (Fig. 1) which was inundated for almost the entire period of observation (November 1986 to January 1988). Species richness was very low: on average, only 12 species occurred per quadrat (Fig. 3).

Eleocharis sedgeland, dominated by *Eleocharis acuta*, occurred in small depressions throughout the reserve (Figs 1, 4) and was most common in the numerous depressions along the western drainage line. It was inundated seasonally, but surface water evaporated in summer causing the silty clay soils to crack deeply. Species richness was very low: viz. 11 species per quadrat (Fig. 3). *Eleocharis* sedgeland was floristically related to *Amphibromus-Agrostis* grass-

Species	%	Species	%
**Romulea rosea*	92	**Leontodon taraxacoides*	39
**Vulpia bromoides*	92	*Schoenus apogon*	39
**Lolium rigidum*	74	*Eryngium ovinum*	38
Themeda triandra	74	*Juncus bufonius*	38
Convolvulus erubescens	67	**Plantago coronopus*	38
**Briza minor*	66	*Acaena echinata*	36
**Bromus hordeaceus*	59	*Danthonia setacea*	36
Oxalis perennans	59	**Briza maxima*	34
**Aira cupaniana*	56	**Cyperus tenellus*	34
Stipa bigeniculata	56	**Cicendia quadrangularis*	33
Danthonia duttoniana	41	**Trifolium striatum*	33
**Hypochoeris radicata*	41	**Trifolium subterraneum*	33

Table 1. Species recorded from 33% or more of quadrats and percentage of quadrats in which each occurred. Asterisks show exotic species.

Vegetation type:	AA	ES	MH	GV				
				rv	rT	mv	mt	pt
species\quadrat	45 34	21 10	13 34	455554434403341 16321769780	122 79	34522131 82525019	351300201240112 26080877356166	3506202153060 5 2494045345521 8
Centipeda cunninghamii				1+				
*Cotula coronopifolia				11				
*Liiaea scilloides				11	2	1		
Myriophyllum spp.				1	2	1		
*Polypogon monspeliensis				++	+	++		
Amphibromus nervosus				33	11	2	+1	
Eleocharis acuta				1	35	4	212+	+
Lobelia pratioides				+	+	+2	31	+1 1 +
*Paspalum distichum				11	+	11		
Eryngium vesiculosum					1	11		
Eleocharis pusilla						+1	2	1+
Juncus flavidus						11	1	++1 +
*Cuscuta epithymum						11	+	
*Critesion marinum						+1	1	
Marsilea hirsuta						+1		
*Trifolium glomeratum						++	1	
*Hainardia cylindrica						11	+	+1 1 2 1
Agrostis avenacea	33	+	11	2111	+	++++	1 1	
Lythrum hyssopifolia	12		+	111	+	++1+	+ 1 1	+ +
Danthonia duttoniana		+	+	21 2	2	2211	+11 11	1 111111
Eryngium ovinum			+	1+		++1+	111+1111	+++ +1+1 +
*Leontodon taraxacoides				2111	12	1111111111	++ +1 1111	
*Plantago coronopus				1++1	2111	11211	+ +	+1+ 1+ 11 +
*Trifolium striatum				+++	1	+ +1	++1 +1 211	2+ + 1 1
Juncus bufonius				1+1+	111+	111+11	11+	111 1 + +
*Briza minor				++++	1+211	+111111	11+ 11 1+	1111111++111 ++1+ +
*Lolium rigidum	1+	+	+	111+	l+++	1+1+ 11	+ 1 1+1111	1+++ ++1+ 11 11 ++ + ++ 1++
*Romulea rosea				11+1	12112	1111111	111 12121111	1111111111111111 1+111111+1112+
*Vulpia bromoides				11+1	22242	5322242	122 5343555	3211111212112212 11211112+11121
*Hypochoeris radicata				1+	+11+	11+1+	+ 11+	+ ++ ++ +1 + + +
Convolvulus erubescens					+++	1111 1++1	++1 1++1 ++	1+ 1+ 111+ +++1+++ +1 1++
*Bromus hordeaceus				+	1+	++ +	+ + 11++11	+ 111111111 11111111 1121
Oxalis perennans					++1	++ ++++++	++1 +++1++	+1+ + + ++1 ++1 ++ ++
Stipa bigeniculata					1	12222 112	1 322 122	1 +11 +111 ++1 + 1+++2 1
Themeda triandra					1	2 1211112	143 11 1	3 3555545533554455255555455554545
Dichondra repens				+	+1+	+11 11		
*Juncus capitatus				+	11+++	1+1+	11++ +	1111
*Cicendia quadrangularis					+++	11+ ++ +11	+1 +	++1+ +
*Trifolium campestre				+	++	+ ++	+ ++ +	+1 + ++ +
Cyperus tenellius				+	1++	1111+ 1	+ +	++ +1+1 1 + +
Schoenus apogon					+11	+1+1+	1+++ ++ +	++++ + ++ +
Asperula conferta					1+	+++1+ +1	+ + +	1+ + 1 + +
Elymus scabrus					+++	+1 + ++		1 + ++ 1 +
*Briza maxima					++	1+ 1 11	+ 2	1 ++1 11+ +11+ 1
Juncus subsecundus				1	++1+	+ 1+	+ + 1 +	+ 1 + + +
Danthonia caespitosa					21	11 11	+1 + 1 1	+ + +++1+
Hypericum gramineum					+	+++1+++	+ + +	+ 1 +
Dichelachne crinita					++	+ +++1	+ + + 1	+ + +
Chloris truncata				1	1111+	+11	111+++++	+ +
Danthonia setacea				1	11111	+1111	+1 11111	1 + +
Acaena echinata					+1+	+++++++++	+++++++	+ + + +
*Aira cupaniana					1111	1111111111	111 1111	1++1111+11 +11111 +
Solenogyne dominii					++	++++1	++1	
Velleia paradoxa					++	+1	+++	
Leptorhynchos squamatus						++1	111	
Helichrysum apiculatum						1	1+1	
Calocephalus citreus				+	+	+ 1 ++1	++1 + +	+
Plantago gaudichaudii					1	+++ 11	111	++++ +11 + + +
Tricoryne elatior						+ +1	+++ + 1+	+
*Sonchus oleraceus					+	+	++ +	+++++ +
*Trifolium angustifolium						++	+1 11+ +1 1	+ ++++ +
*Trifolium dubium				+		+	++ ++	++ + +++++
*Trifolium subterraneum				+			++ ++1111 1	++1 + + +1 +
Isolepis marginata			+	+	+	+ 1	1+	1+
Juncus holoschoenus		1+				+		
*Plantago lanceolata				+	+	1 + +	1 1 +	+ +
Stipa rudis								1 1

Table 2. Floristic table showing vegetation groups. AA = *Amphibromus-Agrostis* grassland, ES = *Eleocharis* sedgeland, MH = mixed-species herbland, GV = grassland vegetation including *Themeda* and *Vulpia* grassland. rV = species-rich *Vulpia* grassland, rT = species-rich *Themeda* grassland, mV = moderate *Vulpia* grassland, mT = moderate *Themeda* grassland, pT = species-poor *Themeda* grassland. See text regarding divisions between grassland groups.

Fig. 2. Amphibromus-Agrostis grassland on edge of Lake Stanley, December 1986; tape measure encloses a 5 × 3 m quadrat.

land (Table 2). Its recognition as a separate group was based on differences in habitat, dominance and appearance as well as floristics.

Mixed-species herbland was co-dominated by a variety of herbs, each of which generally occurred at low cover values. Common species included *Eleocharis acuta* (to 150 mm tall only), *Lobelia pratioides, Danthonia duttoniana, Agrostis avenacea* and **Leontodon taraxacoides* (Fig. 5). This vegetation type was most extensive in a broad zone around Lake Stanley, behind the narrow band of *Amphibromus-Agrostis* grassland, but it also occurred in places along the drainage lines (Fig. 1). It was seasonally flooded but for a shorter period than *Amphibromus-Agrostis* grassland or *Eleocharis* sedgeland. Bare soil was often abundant and deep cracks appeared in late summer. In contrast to the other wetland groups, species richness was very high:

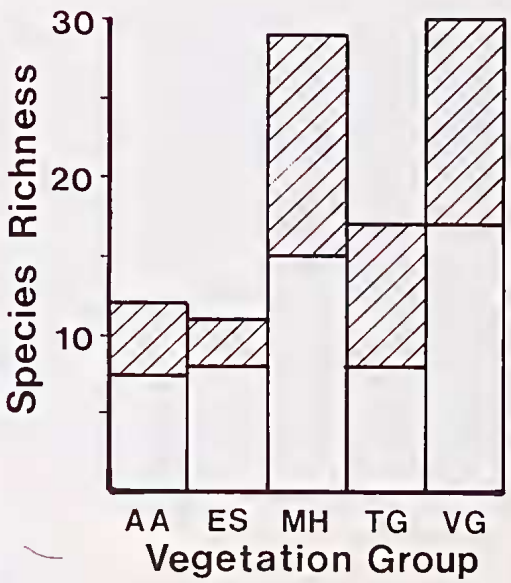

Fig. 3. Mean number of total, native and exotic species in five vegetation types; hatching shows exotic species. AA = *Amphibromus-Agrostis* grassland, ES = *Eleocharis* sedgeland, MH = mixed-species herbland, TG = *Themeda* grassland, VG = *Vulpia* grassland.

viz. 29 species per quadrat (Fig. 3). However, the mean number of exotics per quadrat (15 species) was greater than in all other vegetations (Fig. 3). The total number of species in mixed-species herbland was significantly greater than in *Themeda* grassland and *Eleocharis* sedgeland, and the number of exotic species was significantly greater than in *Themeda* grassland, *Eleocharis* sedgeland and *Amphibromus-Agrostis* grassland ($p \leq 0.05$).

Fig. 4. Eleocharis sedgeland in small depression on western drainage line, December 1986; *Potamogeton tricarinatus, *Lilaea scilloides* and *Myriophyllum* sp. dominate central depression.

Fig. 5. Mixed-species herbland, December 1986; species include *Eryngium vesiculosum, Lobelia pratioides* and *Danthonia duttoniana.*

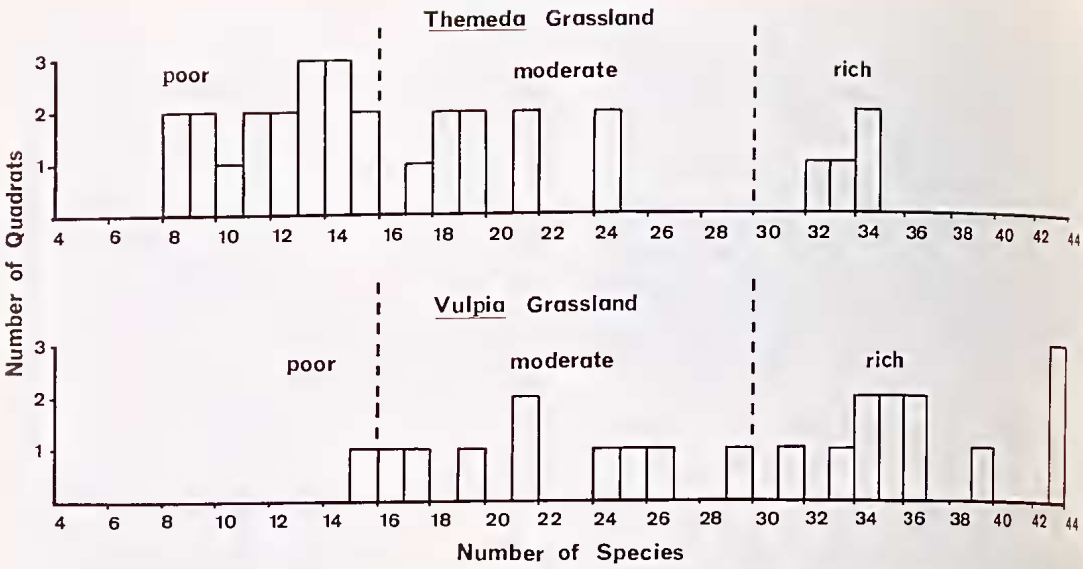

Fig. 6. Number of species recorded from quadrats in *Themeda* and *Vulpia* grassland, and boundaries drawn between species-poor, moderate and species-rich grassland.

Grassland vegetation

The minor grassland groups were differentiated by dominance rather than by floristics, as discrete floristic groups are not easily recognised from Table 2. Instead, it shows a gradual transition from species-rich to species-poor quadrats, regardless of dominant species. Quadrats in which *T. triandra* cover was greater than 25% (i.e. Braun-Blanquet cover values 3 to 5) were defined as *Themeda* grassland; in all but four of such cases *T. triandra* cover exceeded 50% (i.e. obtained a cover value of 4 or 5). Quadrats in which *T. triandra* cover was less than 25% were defined as *Vulpia* grassland; *T. triandra* cover exceeded 5% (i.e. obtained a cover value of 2 to 5) in only three such cases. Despite this arbitrary distinction, the two groups were generally easily recognizable in the field. *Themeda* and *Vulpia* grasslands were divided into three sub-units — species-poor, moderate and species-rich — in order to illustrate general patterns of species-richness in the reserve (Fig. 1). The boundaries between the sub-units were based on arbitrary discontinuities in species richness between quadrats (Fig. 6), and are indicated on the floristic table (Table 2) by dotted horizontal lines.

Themeda grassland was the most widespread vegetation in the reserve (Fig. 1), and occurred in well-drained areas which were not ploughed last century and which were heavily grazed only briefly this century (see site history). In most areas *T. triandra* exceeded 90% cover (Fig. 7). On average, 17 species occurred in each quadrat, including nine exotics and eight natives (Fig. 3), but most quadrats possessed few individuals of few species. Discrete, species-rich patches occurred amongst areas that were generally species-poor. The patches were visually distinctive as tussocks of *T. triandra* were short and stunted and flowering culms were less abundant than in species-poor grassland. Native herbs such as *Helichrysum apiculatum* and *Leptorhynchos squamatus* were usually abundant. The patches were not associated with variations in physical soil features, such as soil texture, colour or pH.

Fig. 7. Species-poor *Themeda* grassland with almost complete cover of *T. triandra*, December 1986; tape measure encloses a 5 × 3 m quadrat.

but may reflect low levels of soil moisture from late spring to early autumn (Lunt 1987); insufficient soil moisture may possibly restrict the growth of *T. triandra* and prevent it from outcompeting herbs.

Vulpia grassland was dominated by the exotic annual **Vulpia bromoides*, often with subdominant *Stipa bigeniculata* and occasionally with the exotic **Stipa neesiana* (Fig. 8). This grassland occurred along drainage lines and in areas that were ploughed last century or grazed heavily this century, such as the western end of the fence that once divided the reserve (Fig. 1). The cover of *T. triandra* in *Vulpia* grassland was slightly under-estimated as quadrats were orientated to include uniform vegetation, and consequently to avoid small patches of *T. triandra*. With the possible exception of some sites along the drainage lines, areas of *Vulpia* grassland were probably dominated by *T. triandra* prior to ploughing and grazing. The abundance in *Vulpia* grassland of exotics such as **Briza minor*, **Lolium rigidum*, **Trifolium* species and **Romulea rosea* probably reflected the relatively open cover. Most of these species were common in *Themeda* grassland as soil-stored seed (Lunt 1990a) but germination was presumably suppressed by the closed sward. These species regenerated profusely when the *Themada* grassland was burnt (Lunt 1990b). *Vulpia* grassland contained significantly more native species than *Themeda* grassland, and significantly more exotics than *Themeda* grassland, *Amphibromus-Agrostis* grassland and *Eleocharis* sedgeland ($p < 0.05$). Areas ploughed last century were amongst the most diverse in the reserve. On average, 17 natives and 13 exotics occurred in each quadrat (Fig. 3).

Fig. 8. Species-rich *Vulpia* grassland with forbs including *Convolvulus erubescens, Helichrysum apiculatum* and *Eryngium rostratum; Themeda* grassland occurs in background. Photographed in December 1986.

Original vegetation

Due to the almost complete destruction of the native vegetation of the basalt plains and the marked modification of relict patches, especially by the establishment of exotic species, it is almost impossible to reconstruct accurately the vegetation of the Derrimut reserve as it existed at the time of European settlement. However, the following points may be made.

The area was a natural grassland, devoid of trees (Stuwe 1986, McDougall 1987), with *T. triandra* dominating in all well-drained areas. The density of *T. triandra* was probably lower and native herbs were presumably more common in the abundant inter-tussock spaces. Patton (1935) illustrated a quadrat in *Themeda* grassland with 16 native species in 0.8 m^2, a species richness far greater than that recorded from Derrimut. Many species were presumably depleted or eliminated by continual grazing, a lack of burning and isolation from seed sources in undisturbed grassland remnants. Native orchids, legumes, chenopods and lilies are now particularly rare. Circumstantial evidence of species losses is provided by the ratio of native grasses to native forbs, since grasses are generally more tolerant than forbs of grazing and trampling (Crawley 1983). Whereas grasses comprise only 10% of the native species on the Keilor Plains, and 13% of those in an ungrazed rail reserve at St Albans (Willis 1964, Groves 1965), they comprise 27% of native species in the Derrimut reserve and, similarly, 26% of those in the Laverton North Grassland Reserve (Platt 1983 and unpublished data). This high

proportion of grasses probably reflects the elimination of many native forbs — and possibly, to a minor extent, the ingress of some native grasses — throughout a century of grazing.

Lake Stanley appears to have formed when Boundary Road was constructed on its southern edge. From the topography, it is suspected that the lake site was originally flooded by shallow water for only a short period of the year. Consequently, the present distribution and composition of mixed-species herbland and *Amphibromus-Agrostis* grassland undoubtedly differ from the original. A few shrubs of *Muehlenbeckia cunninghamii* survive on the lake edges, and this species may originally have dominated above a species-rich herbland. Relict swamps dominated by lignum occur elsewhere in the region (McDougall 1987). Changes to the drainage patterns due to road building, to pugging of the soil by stock, and to the replacement of perennial by annual grasses in nearby paddocks, are also likely to have modified the original vegetation of the drainage lines.

Few floristic data are available from comparable vegetations in Victoria. *Themeda* grassland at Derrimut is similar in composition to that described from grazed paddocks and rail easements on the basalt plains of western Victoria (Groves 1965, Stuwe & Parsons 1977, Stuwe 1986), and *Themeda* and *Vulpia* grasslands appear distantly related to the "*Eucalyptus viminalis/Eucalyptus ovata/Eucalyptus pauciflora-Convolvulus erubescens* grassy woodland" community (Evc) in the Midlands of Tasmania (Kirkpatrick et al. 1988). Virtually no floristic data are available from seasonal wetlands on the basalt plains. Wetland vegetations at Derrimut are among the "shallow swamps on basalt" which are in need of "urgent protection" in Victoria (Frood & Calder 1987), and further surveys are urgently required.

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APPENDIX

Vascular plants of the Derrimut Grassland Reserve. Nomenclature follows Forbes and Ross (1988). Asterisks denote exotic species.

PTERIDOPHYTA
ADIANTACEAE
Cheilanthes sieberi

MARSILEACEAE
Marsilea hirsuta

ANGIOSPERMAE
MONOCOTYLEDONEAE
CYPERACEAE
Carex inversa
**Cyperus eragrostis*
**Cyperus tenellus*
Eleocharis acuta
Eleocharis pusilla
Isolepis hookeriana
Isolepis marginata
Schoenus apogon

IRIDACEAE
**Romulea rosea*

JUNCACEAE
Juncus bufonius
**Juncus capitatus*
Juncus flavidus
Juncus holoschoenus
Juncus homalocaulis
Juncus radula
Juncus subsecundus

JUNCAGINACEAE
**Lilaea scilloides*

LILIACEAE
**Allium vineale*
Caesia calliantha
Dianella revoluta
Hypoxis sp.
Tricoryne elatior
Wurmbea dioica

ORCHIDACEAE
Microtis? unifolia

POACEAE
Agrostis avenacea
**Aira cupaniana*
Amphibromus nervosus
**Anthoxanthum odoratum*
**Avellinia michelii*
**Avena fatua*
Bothriochloa macra
**Briza maxima*
**Briza minor*
**Bromus hordeaceus*
Chloris truncata
**Critesion hystrix*
**Critesion murinum* ssp. *leporinum*
**Critesion marinum*
**Cynodon dactylon*
**Dactylis glomerata*
Danthonia auriculata
Danthonia caespitosa
Danthonia carphoides
Danthonia duttoniana
Danthonia eriantha
Danthonia racemosa
Danthonia setacea
**Desmazeria rigida*
Deyeuxia quadriseta
Dichelachne crinita
Elymus scabrus
Eragrostis brownii
**Gastridium phleoides*
**Hainardia cylindrica*

**Holcus lanatus*
**Lolium rigidum*
**Nassella trichotoma*
Panicum effusum
Panicum prolutum
**Paspalum distichum*
Pentapogon quadrifidus
**Phalaris minor*
Poa labillardieri
Poa sieberiana
**Polypogon monspeliensis*
Stipa bigeniculata
Stipa gibbosa
**Stipa neesiana*
Stipa rudis
Stipa setacea
Themeda triandra
**Tribolium acutiflorum*
**Vulpia bromoides*
**Vulpia myuros* forma *megalura*

POTAMOGETONACEAE
Potamogeton tricarinatus

DICOTYLEDONEAE
AMARANTHACEAE
Ptilotus macrocephalus
Ptilotus spathulatus

APIACEAE
Eryngium ovinum
Eryngium vesiculosum

ASTERACEAE
**Arctotheca calendula*
Brachyscome basaltica
Brachyscome heterodonta
Calocephalus citreus
Calotis anthemoides
Calotis scapigera
Centipeda cunninghamii
**Cirsium vulgare*
**Cotula coronopifolia*
Craspedia chrysantha
Craspedia glauca
**Cynara cardunculus*
Gnaphalium indutum
Gnaphalium polycaulon
**Gnaphalium purpureum*
**Hedypnois cretica*
Helichrysum apiculatum
Helichrysum rutidolepis
**Hypochoeris glabra*
**Hypochoeris radicata*
**Leontodon taraxacoides*
Leptorhynchos squamatus
Microseris scapigera[1]
Minuria leptophylla
Myriocephalus rhizocephalus
**Picris echioides*
Podolepis jaceoides
**Scorzonera laciniata*
Senecio quadridentatus
Solenogyne dominii
**Sonchus asper*
**Sonchus oleraceus*
**Tragopogon porrifolius*
Vittadinia cuneata

BRASSICACEAE
**Lepidium* sp.

CAMPANULACEAE
Lobelia pratioides
Wahlenbergia communis
Wahlenbergia gracilenta

CARYOPHYLLACEAE
**Cerastium glomeratum*
**Sagina procumbens*
Spergularia rubra
Stellaria palustris

CLUSIACEAE
Hypericum gramineum
**Hypericum perforatum*

CONVOLVULACEAE
**Convolvulus arvensis*
Convolvulus erubescens
Dichondra repens

CRASSULACEAE
Crassula decumbens

CUSCUTACEAE
**Cuscuta epithymum*

DROSERACEAE
Drosera peltata ssp. *peltata*

FABACEAE
Desmodium varians
Glycine tabacina
**Medicago polymorpha*
**Trifolium angustifolium*
**Trifolium campestre*
**Trifolium dubium*
**Trifolium glomeratum*
**Trifolium repens*
**Trifolium striatum*
**Trifolium subterraneum*
**Vicia* sp.

GENTIANACEAE
**Centaurium tenuiflorum*

[1] *Microseris scapigera*
recorded by N. H. Scarlett (pers. comm.)

**Cicendia filiformis*
**Cicendia quadrangularis*
Sebaea ovata

GERANIACEAE
**Erodium botrys*
**Geranium dissectum*

GOODENIACEAE
Goodenia gracilis
Velleia paradoxa

HALORAGACEAE
Haloragis heterophylla
Myriophyllum sp.[2]

LAMIACEAE
**Marrubium vulgare*
Mentha diemenica[3]
**Salvia verbenaca*

LINACEAE
Linum marginale

LYTHRACEAE
Lythrum hyssopifolia

MALVACEAE
**Modiola caroliniana*

ONAGRACEAE
Epilobium billardierianun

OXALIDACEAE
Oxalis perennans

PLANTAGINACEAE
**Plantago coronopus*
Plantago gaudichaudii
**Plantago lanceolata*

POLYGALACEAE
Comesperma polygaloides

POLYGONACEAE
Muehlenbeckia cunninghamii
**Polygonum aviculare*
**Rumex conglomeratus*
Rumex dumosus

PRIMULACEAE
**Anagallis minima*

ROSACEAE
Acaena echinata
**Rosa rubiginosa*

RUBIACEAE
Asperula conferta

SCROPHULARIACEAE
**Kickxia elatine* ssp. *crinita*
**Linaria pelisseriana*
**Parentucellia latifolia*
Veronica gracilis

SOLANACEAE
**Lycium ferocissimum*

STACKHOUSIACEAE
Stackhousia monogyna

THYMELEACEAE
Pimelea curviflora
Pimelea serpyllifolia

[2] *Myriophyllum* sp. = *M. propinquum, sensu* Willis (1972)
[3] *Mentha diemenica* recorded in 1987 by D. Tonkinson (pers. comm.)